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ABSTRACT

Describing outcomes for the collaborative learning (CL) program at California's Glendale Community College (GCC), this report describes the CL program, student results by program, and issues related to implementation. Part I describes the establishment of CL at the college and indicates that it provides students enrolled in traditionally difficult courses with the opportunity to work together on problem-solving and concept mastery during small workshops outside of class hours. Part II discusses longitudinal outcomes of CL in Allied Health, Biology, Business, English, English as a Second Language (ESL), Mathematics, Physical Sciences, Social Sciences, Technical Education, and Visual and Performing Arts, comparing success rates of sections offering CL to those not offering it. The final section describes issues related to implementing CL at the college, including: (1) program costs, indicating that in 1992-93 it cost GCC $15 per student served; (2) the current status of the program, indicating that in fall 1994 over 56 workshops per week in 24 courses were offered; (3) the overall effect of CL, highlighting a definite pattern of improved outcomes for sections offering CL; (4) the limits of CL, emphasizing the challenge of serving students with basic skills deficiencies; (5) techniques for increasing student participation, such as making attendance mandatory, ensuring convenient scheduling, obtaining faculty involvement, and ensuring a clear connection between the workshop and course; and (6) program evaluation, stressing the importance of continuous feedback and evaluation for program improvement. (TGI)

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ED 388 364

COLLABORATIVE LEARNING AT GLENDALE COMMUNITY COLLEGE

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I. INTRODUCTION: OVERVIEW OF PROGRAM

The collaborative learning (CL) program at Glendale College was developed under a Title III grant from the Department of Education. It was designed to provide special workshops, outside of class hours, for students enrolled in traditionally difficult courses. These workshops, usually one to two hours in length, were offered two or three times per week throughout the semester. They gave the students the opportunity to work collaboratively on problem solving or on concept mastery, as well as on improving their study skills. They were supervised by student leaders, usually recruited among recent graduates of the targeted classes.

Two workshop formats were utilized. In math and science courses, the approach was based on the model developed by Uri Treisman at the University of California, Berkeley in the 1970s. The students worked together on solving the problems written on a worksheet prepared by the instructor. The student leaders acted as resources, answered questions, and helped facilitate the group interactions. The instructor was present during part, and sometimes most, of the workshops to assist the student leaders.

In lecture-based courses such as history, political science, economics and the like, a second model was used, the one known nationally as Supplemental Instruction and developed at the University of Missouri, Kansas City, also in the 1970s. There students utilized strategies such as note review, brainstorming, and shared discussion techniques to enhance retention and comprehension of the course material and to verbalize and resolve difficulties. The student leaders prepared the workshop materials and facilitated the groups discussions using a variety of learning techniques to help the students incorporate more effective study skills with the course content. Often they attended class along with the rest of the students and served as highly visible role models. The instructors themselves usually did not attend the workshops.

Many workshops used elements of the two models: actual formats were determined by the content of each course and the preferences of the teacher. The leader-to-student ratio varied in every workshop, but was targeted at a minimum of 1:5 and a maximum of 1:10. If groups were larger at some workshops, student leaders are encouraged to break them into smaller sub-groups. Very small groups tended to be less effective.

Extensive statistics have been compiled by the University of Missouri and by Dr. Treisman and others, to document the success of such collaborative learning programs. The following report is not meant as a similar research experiment but simply as a document on the Glendale College experience with these programs.

A pilot program was conducted in the spring of 1990, with five courses selected to participate:

English 101 (Freshman English)
English 120 (Pre-requisite to English 101)
ESL 151 (English as a Second Language, composition)
Math 103 (Calculus, first semester)
Physics 105 (Algebra-based physics)

All the courses were chosen on the basis that they were considered "high risk", meaning all had a low success rate (60% or less students in the class receiving A, B or C grades). Results were analyzed, and an end-of-semester student survey was administered in all five classes to measure student satisfaction with the workshops.

Overall, the experiment was very encouraging: many students felt it had positively impacted their final grade and indeed the success rates improved. The successes, however, were recorded mostly in math and physics, and not much in the English classes. The mixed results in English were repeated in subsequent semesters and eventually led to the abandonment of the approach in those classes. The lessons learned in the pilot were used to plan the program and the evaluations were repeated each year afterwards to continue improving it.

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II. RESULTS OF THE PROGRAM

1. Allied Health

Beginning the Spring semester 1991 and continuing through the Fall 94 semester, CL targeted Allied Health 108, Clinical Nursing, a course that focuses on applying theoretical principles and concepts of holistic patient care learned in previous nursing classes. In another class, Allied Health 233, Mental Health Nursing, workshops were offered beginning Fall 91 through Spring 93.

In order for the division to retain its State certification, its students must maintain an 80% student success rate on the State Board examination. The collaborative learning workshops have proven extremely effective to this end. According to the division chair, since the addition of CL and thanks in part to its contribution, the students have been passing the boards at a much higher passage rate. The summer 93 rate was 86%, versus 75% the year before, a difference of more than 10%. In addition, students gain much-needed confidence when they are afforded the opportunity to practice the necessary basic nursing skills among fellow students before being required to perform in the hospital setting.

Allied Health

Class/Sections	No. of Students	Success rate	GPA
AH 108 (Sp 88 to Sp 94)			
Sections with no CL	217	81%	3.5
Sections with mandatory CL	272	91%	3.5
AH 233 (Sp 88 to Sp 93)			
Sections with no CL	142	86%	2.8
Sections with mandatory CL	90	92%	3.0

Allied Health 108: Student leaders reinforced or reviewed theoretical concepts and then supervised the students as they practiced each skill. Related knowledge, concepts, or other additional study techniques were incorporated as needed. A 1:10 leader-student or less ratio was attempted when there were sufficient CL student leaders available.

Comments: As of the Spring 91 semester all sections were offered CL workshops. Instructor and student satisfaction with workshops has been extremely high. The students view workshops as useful and necessary to their success. They often request them for their other courses. When asked what could improve the workshops, many indicated better equipment on which to practice.

Allied Health 233: This course moves very fast and covers much complex material. The CL leader and instructor employed a variety of techniques to improve success, including games in which smaller groups of students developed possible test questions and quizzed each other to test application of knowledge.

> Instructor's Comments: *CL created group cohesiveness...working in groups successfully is essential in nursing. Nurses in leadership roles need to be successful facilitators. In AH 233 there are no "right answers", but in CL, students have the opportunity to hear and process a variety of answers and realize that they could be correct. The material from class is reinforced in CL and students learn via different modalities.*

Comments: Starting the Fall 91 semester, through Spring 93, all sections were offered CL. Retention, success rate and GPA on average were higher than previous semesters except for one section of the Fall 91 semester. Low reading levels seems to have contributed to the lower percentages. After the Spring 93 semester, there was a change of instructor and CL has temporarily been suspended in this class.

One problem in all the Allied Health courses is the lack of available student leaders due to the scheduling conflicts that arise once students move onto their next level of courses. Continued involvement by the instructors is necessary to ensure continuity and accuracy of the information circulated by the student leaders, a particularly critical need in this field.

2. Biology

Biology 115: Human Biology is the only course offering CL workshops so far in this division. It is an introductory course covering biological principles as they apply to the human body. It is required for most students going into the health field. Workshops have been offered consistently since Fall 92. The course is taught by two instructors who alternate semesters.

Biology

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Bio 115 (F 90 to Sp 94)				
Sections with no CL	266	0	54%	2.4
Sections with optional CL				
-Regular participants	40	50-100%	88%	3.0
-Irregular participants	113	1-49%	41%	1.9
-Non-participants	117	0	44%	2.1

Comments: Overall, while students continue to struggle with the difficult concepts in the class and the technical nature of the information, CL is helping many students do better and is thought to be a real benefit by both instructors and students who take advantage of the extra learning experience. An observation made by both instructors who teach Human Biology was that many students who desire a career in the health field really do not have a clear idea of what to expect and how hard they need to work to be successful in this field. Human Biology is one of those courses that definitely sorts out the less motivated student.

3. Business

The Business Division started workshops in Accounting 101, Principles of Accounting I, and, after numerous student requests, workshops were added to its sequel, Accounting 102. In both classes, workshops are usually offered two to three times per week and run one to one-and-one-half hour per session. Students practice different types of accounting problems and review concepts and vocabulary. All workshops are voluntary. During the Spring 93 semester, the division began workshops in the Introduction to Computer Information class (CS/IS 101). Interest in CL for other general and introductory business courses has also been expressed for future inclusion.

Accounting

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Acc 101 (Sp 88 to F 94)				
Sections with no CL	1921	0	52%	2.4
Sections with optional CL				
-Regular participants	62	50-100%	84%	2.7
-Irregular participants	193	1-49%	68%	2.5
-Non participants	412	0	41%	2.2
Acc 102 (Sp 90 to Sp 94)				
Sections with no CL	562	0	75%	2.9
Sections with optional CL				
-Regular participants	46	50-100%	87%	2.9
-Irregular participants	42	1-49%	79%	3.1
-Non participants	96	0	64%	3.0

Accounting 101: This is an introductory core course that is required for business majors. CL workshops consisted of review of the vocabulary of the discipline plus hands-on problem solving

similar to what would appear on tests. The students were encouraged to use collaborative techniques in looking at concepts from a variety of perspectives in order to better comprehend them.

> Instructor's comments: *Students who attend faithfully received material benefits from attending CL, both in test and class performance and overall understanding of the subject. CL should offer more workshop times to alleviate attendance conflicts.*

Comments: During the Fall 91 semester, the CL participants' GPAs were quite a bit higher. Several factors may have contributed to the higher CL group's GPAs. An outstanding student leader facilitated Spring and Fall 91 and Spring 93. The student leader who consistently was involved in the workshops was a real asset to the program and definitely contributed to the success students achieved. Additionally in the Fall 91 semester, the workshops were held in the actual lecture classroom in between the two targeted CL sections of Accounting 101. While this may seem a small detail, the easier students have access to CL workshops, the better the voluntary attendance.

Accounting 102: This course is a continuation of Accounting 101 and is also a required core course for business majors. The workshop format was similar to that offered in Accounting 101.

Comments: The accounting workshops have proven effective when all pieces of a good CL program are in place: student perception of CL as necessary to their success, strong CL student leaders who are able to attend the lecture class, or meet regularly with the instructor, instructor support, adequate facilities and scheduling flexibility. Those students attending workshops indicated a high degree of satisfaction with the workshops. Starting with the Spring 93 semester, new structures were added by one instructor teaching Accounting 101: she uses real life case studies for the students to apply the course concepts to. In addition, an extra bonus point incentive given by the instructor did boost attendance in his sections of both 101 and 102. This fall, however, the withdrawal of this incentive led to a significant drop in attendance.

Computer Science

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
CS/IS (F 91 to Sp 94)				
Sections with no CL	1725	0	70%	2.6
Sections with optional CL				
-Regular participants	8	50-100%	100%	3.4
-Irregular participants	90	1-49%	77%	2.6
-Non participants	163	0	38%	1.8

Computer Science/Information Systems 101: This is an introductory course in computer science designed to present the concepts and the technology of information processing to students planning on a business career.

Comments: The first few semesters that offered CS/IS workshops, low attendance was a problem and made it difficult to evaluate the effect of workshops. Students who did attend regularly, however, benefitted greatly. As more data becomes available a clearer picture will emerge with which to analyze the effectiveness and feasibility for this course. The current semester holds great promise, as the instructor is re-structuring the workshop format for greater relevance.

4. English

English 101, Freshman English, and its feeder course, English 120, were both included in the original CL pilot in the spring of 1990. Although they are both difficult classes with a great need for extra assistance to students, the CL formula did not seem to answer that need very well and its use was discontinued shortly thereafter.

English 101: This is a foundation course in composition focusing on reading and writing skills and it is part of the general educational requirements for transfer students going on to four year institutions. Workshops were offered for the beginning pilot and again in the fall and spring of 91, all under the same instructor. Initially, the workshops were mandatory and offered two times per week for an hour. As the semester progressed only one per week was offered. The instructor attended workshops at the beginning of the semester and tapered off towards the end, as student leaders became more experienced. During the workshops, students would be offered the opportunity to present a topic and plan to develop a paper that would then be critiqued by the members of the group, who evaluated the paper's strength and weaknesses and suggested revisions. By evaluating each other's work, students could share their writing strategies and receive feedback in a less threatening atmosphere.

In the Fall 91 semester, the workshop was changed to a voluntary format that met three times per week with no instructor present. For the Spring 91 semester, two one-and-one-half hour workshops were offered per week, and students were informed in advance of the topics that would be reviewed in each session.

Comments: Instructors felt that students could benefit from the CL experience in a variety of ways but that, unless forced to attend, they would not readily see the advantage of the workshops, especially at-risk students. Indeed voluntary attendance was low. This was reinforced by student comments stating they did not feel the need to go to workshops. They seemed to benefit more from the one-on-one help provided at the Writing Lab or, when it became available, from group and individual work in the computer equipped Writing Classroom, another project funded by the Title III grant. These CL difficulties seemed to echo the experience of other colleges who also found it difficult to use the format in English classes.

English 120: This is a composition and reading class that provides practice in the mechanics of writing paragraphs and essays. Over 90% of students enrolled are usually former ESL students. The class was part of the pilot Spring 90 semester. The format included one-on-one contacts at the workshops plus group ones. The project was not very successful and was discontinued. The comments made above for English 101 apply here as well.

5. English as a Second Language (ESL)

The ESL curriculum has five levels of difficulty. The lower levels courses are non-degree applicable but at level III or above they are transferable. Two courses were targeted: ESL 151, reading and composition level V, and ESL 141, grammar and writing level IV. The first one has been in the program since the spring of 1990 while the second was added in 1992.

English as a Second Language

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
ESL 151 (Sp 88 to Sp 94)				
Sections with no CL	676	0	52%	2.0
Sections with optional CL				
-Regular participants	127	50-100%	46%	2.3
-Irregular participants	28	1-49%	40%	2.0
-Non participants	21	0	10%	1.1
ESL 141 (F 90 to Sp 92)				
Sections with no CL	59	0	63%	2.4
Sections with optional CL				
-Regular participants	11	50-100%	73%	2.6
-Irregular participants	15	1-49%	67%	2.0
-Non participants	12	0	58%	2.5

ESL 151: This course is designed for non-native students who are proficient in English and are able to compete with native students in most college courses except those that may require essay exams. Practice in various types of essay writing, stressing essay development as well as critical reading assignments, are included. ESL 151 is a pre-requisite for many introductory level courses.

ESL 151 was selected for inclusion in the Spring 90 pilot using a voluntary workshop with the instructor present. Successive semesters utilized a format without the presence of the instructor.

Workshops varied between three and four per week, meeting for an hour each session. Initially, students worked on editing their compositions for classes, with vocabulary and grammar reviews as necessary. Participation was sporadic in the ESL 151 workshops after the initial pilot. It was felt that more structure was necessary for students to see the value of workshops contributing to their success. Several re-structuring experiments were tried, including making workshops mandatory in the Fall 91 semester.

When the Spring 92 workshop was offered, the instructor supplied a reading assignment to be discussed by the group and later incorporated into in-class writing assignments. These group activities seemed to help the students write more articulate, well-supported essays. Attendance was quite good when more structure was provided to students. This ESL 151 course was paired with a content course after the Spring 93 semester and as a result, the CL workshop was offered more in conjunction with the content-paired lecture. During the Spring 93 semester, workshops were offered at a time that fell between the two paired lecture courses, and proved to be an opportune time to schedule the CL. This same schedule will be followed for the Spring 95 semester.

Comments: Results show that the success rate of the CL sections seems to be lower than the non-CL sections, which is mostly due to differences in instructor grading policies. It is clear, however, that the CL participants passed at a much higher rate than non-participants. In addition, the workshops appear to benefit students in more qualitative ways, as mentioned above, and possibly to increase student persistence (whether the student continues in college), an effect that should be measured more carefully when sufficient data is available.

ESL 141: This is for students at the advanced level of grammar in English and provides practice in applying grammatical structures through writing assignments and original compositions. Workshops were attempted in two consecutive semesters, fall 91 and spring 92, using a format that was voluntary. They were scheduled two times per week for an hour in length. The instructor was often present at the workshops. Student leaders assisted the students with essays or group assignments.

Comments: The data gathered is not significant enough to draw conclusions other than comparing the success rates of participants and non-participants during the Fall 91 semester. Benefits again were difficult to quantify. Students felt workshops were helpful generally but could not always articulate why. Student leaders were sometimes unsure as to their role at the workshops. The instructor, who was part-time, was unable to devote a lot of time meeting with student leaders, an important component for success. The workshop was cancelled midway through the spring 92 semester due to this problem. If a higher level student leader had been available who felt comfortable working without the guidance of the instructor, the workshops would have been able to continue. In this instance, the student leader had only completed the course the semester preceding this one and did not feel qualified to truly "lead" the workshops. Adjunct faculty often encounter this problem when involved in a CL program and often do not have the opportunity to teach the same course semester after semester. Continuity is difficult to achieve.

6. Mathematics

CL has been offered at various times, during the past five years, in the following classes: Math 100, Math 110, Math 103, Math 104, Math 112 and Math 141. The workshops have all been of a Berkeley format, focusing on problem solving. They were sometimes mandatory, with the instructor present, sometimes optional with occasional visits by the instructor but no continuous attendance. The math department rotates all instructors every few semesters; therefore the same instructor does not necessarily teach the same courses every time, which accounts for the somewhat discontinuous pattern of CL participation in math classes. Most of the full-time math instructors have successfully employed collaborative workshops or variations of the format in their sections.

Math 100: At GCC this is the standard "college algebra" course. The success rate has been around 40%. It is often taken, with Math 102 (Trigonometry) by engineering and science majors. CL workshops in Math 100 have been offered three semesters to date: spring 91, spring 92 and spring 93, coinciding with one instructor's scheduled turn to teach this course.

Comments: The CL sections have done significantly better overall than those that were not targeted. Although only three sections were involved, the results are similar to what is observed in other math classes, such as Math 103, where the workshops were offered to a much larger number of students.

Math 110: This is a pre-calculus course designed to review algebraic and trigonometric concepts needed for the study of calculus. It may be taken by engineering and science majors in place of Math 100 and 102, and it has often proven to be a stumbling block with a traditional success rate of only about 50%. Workshops have been offered almost continuously since the fall of 1990.

> Instructor's Comments: *CL teaches more than math skills, it guides students in how to study in all areas. It links students together in a learning environment, emphasizes active learning skills and gives them satisfaction, not drudgery, in arriving at their goal. Collectively, students agree upon a solution to a problem. From the instructor's perspective, CL provides specific class assessment, renews instructor interest and enthusiasm and gives the instructor an even larger, more personal stake in student success.*

Comments: Several semesters of CL show success rates clearly above the norm. A significant increase was realized in the Fall 91 semester (80% success). The high GPA may indicate that the basic skills level of this particular class was above average also.

Math 103: This course is the first step in the three-semester calculus sequence for the engineering and science majors. The course combines analytic geometry and calculus. Its traditional success rate has also been around 50%, and often lower. The CL workshops have been offered quite consistently since the original CL pilot project. The success obtained in that class during the first semester (70% success rate in the section with mandatory CL vs 38% in the others) did much to publicize the value of the workshops.

Mathematics

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Math 100 (F 90 to F 94)				
Sections with no CL	1168	0	43%	2.2
Sections with mandatory CL	40	100%	60%	2.5
Sections with optional CL				
-Regular participants	24	50-100%	88%	2.8
-Irregular participants	40	1-49%	60%	2.3
-Non participants	19	0	26%	2.1
Math 110 (Sp 88 to Sp 94)				
Sections with no CL	1740	0	49%	2.0
Sections with mandatory CL	120	100%	62%	2.3
Sections with optional CL				
-Regular participants	49	50-100%	76%	3.5
-Irregular participants	77	1-49%	29%	1.5
-Non participants	71	0	25%	1.4
Math 103 (Sp 88 to Sp 94)				
Sections with no CL	1518	0	50%	2.2
Sections with mandatory CL	253	100%	67%	2.7
Sections with optional CL				
-Regular participants	30	50-100%	90%	3.0
-Irregular participants	39	1-49%	33%	2.0
-Non participants	60	0	32%	2.0
Math 104 (Sp 91 to Sp 94)				
Sections with no CL	358	0	61%	2.4
Sections with optional CL				
-Regular participants	58	50-100%	81%	3.3
-Irregular participants	17	1-49%	53%	2.2
Math 112 ((Sp 88 to Sp 94)				
Sections with no CL	1608	0	51%	2.1
Sections with optional CL				
-Regular participants	35	50-100%	95%	2.8
-Irregular participants	9	1-49%	100%	3.7
-Non participants	27	0	60%	2.2

Comments: The Math 103 workshops have proven to be among the most successful attempts at CL. Student satisfaction is high. A typical comment from students was "CL workshops enhanced my ability to solve problems faster and get a better grade. I really appreciated having them." Students did not view workshops as remedial in any way, but rather a way to challenge their abilities. Voluntary sessions were usually well attended considering time constraints of commuter students. One evening section offered only one workshop each week: it was less well attended compared to daytime sections, but was still effective for its participants. The CL success rate and GPA is generally significantly higher compared to the non-CL rate. A greater increase in success happens when the students are required to attend, but even in the voluntary workshops, gains are evident. Students respond over and over that without the workshops they would have been lost.

Math 104: This is the second step of the above-mentioned calculus sequence. The workshops have been offered only twice, on an optional basis, but with great success. The success rate in this class is higher due to the selection effect of the preceding classes, but the workshops still produced a substantial improvement.

Math 112: This is a calculus course designed for business, management, and social science majors. For the Fall 93 semester, CL workshops were well attended by over 80% of the class going on a regular basis. The Spring 94 semester also was considered successful by the instructor and students. So far, the Fall 94 semester is going quite well as far as attendance is concerned.

> Students' Comments: *Having the opportunity to attend CL for any challenging class (i.e. Math 112) is extremely helpful in understanding all the troubling concepts. I only wish I had CL's available for some of my other challenging classes.*
> *-I believe without CL I would not be able to pass my math class.*
> *-Are you an average student who thought you would never pass math? Join a CL class and it will help you become a successful student and get a better grade. It is worth spending your time on.*
>
> Instructor's Comments: *CL allows more time for me to get to know my students' lives and problems better and exposes me to different learning styles. It provides emotional support groups for the students, improves their study habits and gives them a fighting chance.*

Math 141: Called fundamentals of algebra this course covers the basic operations of algebra. It is the equivalent of one year of high school algebra.

Comments: Workshops were offered for one semester, as an experiment, to multiple sections of Math 141 (and also Math 112) taught by different instructors. This approach proved unsuccessful. In trying to reach a larger portion of students, less connection with a specific targeted section was attempted. Despite some positive responses, students did not perceive that workshops were helpful to them. Coordination problems and differences in pacing by instructors proved too frustrating. No significant data was gathered for either experiment. It was concluded that at the entry level, a more structured approach specifically connected to one or two instructors' classes is necessary.

7. Physical Sciences

The following courses offered workshops in the physical science division: Physics 105, 106, and 101, Chemistry 101, 102, 105, 106 and 110.

Physics 105: As a first semester of algebra-based physics, this course is addressed at pre-dental and pre-medical students as well as engineering students with insufficient physics backgrounds. Physics 105 is the feeder course for Physics 101 and 106. CL workshops have been offered consecutively since the Spring 1990 pilot using structured worksheets. All workshops have been voluntary, as students have no other section of that class to choose from during the semester.

Physics 105

Semester	Participation rate*	Success Rate	GPA
Fall '87	0	36%	1.6
Spring '88	0	39%	1.9
Fall '88	0	44%	2.1
Spring '89	0	41%	2.0
Fall '89	0	48%	1.8
Spring '90	34%	55%	2.2
Fall '90	45%	55%	2.2
Spring '91	35%	50%	2.3
Fall '91	47%	74%	3.0
Spring '92	29%	48%	2.2
Fall '92	33%	66%	2.8
Spring '93**	53%	63%	2.7
Fall '93**	69%	75%	2.6
Spring '94**	73%	69%	2.5
Fall '94**	76%	81%	2.6

Note: Since the Spring of 1990, students attending half or more of the workshops have a cumulative success rate of 87% (404/466); those attending less than half, 42% (176/419).

* Percentage of students attending half or more of the workshops.

** Starting in the Spring of 1993, students were offered the incentive of being able to count workshop attendance (2 hours/week) as homework; the homework points represent 6% of the total grade.

Comments: The physics workshops, as in mathematics, have been among the most successful workshops to date. This course has been targeted the most consistently of any course offering CL and because the same instructor taught all sections, the data gathered tells a clear story and really illustrates the effectiveness of the CL workshops. This is partly due to a number of factors: active participation at workshops and strong support of the program by the instructor, well designed graduated-in-difficulty worksheets and excellent student leaders. The students perceive the workshops as enhancement, not remediation, and they see a direct linkage between workshop materials and exams questions. Longevity and continuity are also vital factors. Word-of-mouth has clued each succession of students to the helpfulness and even necessity of the workshops. The instructor meets with student leaders weekly and reviews the workshop materials and the strategies to utilize to help facilitate the groups.

The data on Physics 105 also show the correlation between participation and success rates, and it is very strong. A rough calculation of this correlation shows the success rate essentially doubling (from the low 40s to the low 80s) as the participation goes from 0 to 100%, a very remarkable effect indeed!

Physics 106 and 101

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Phy 106 (Sp 88 to Sp 94)				
Sections with no CL	69	0	70%	2.8
Sections with optional CL*	95	-	89%	3.0
Phy 101 (Sp 88 to Sp 94)				
Sections with no CL	182	0	78%	2.6
Sections with mandatory CL	198	100%	85%	2.9

* Records of student attendance were not kept consistently but the participation rate was usually fairly high, probably around 60 to 70%, since those students had for the most part used the workshops in Physics 105 and had come to rely on them.

Physics 106: This is the continuation of Physics 105 and workshops there have been scheduled at the request of students who had grown accustomed to rely on them in Physics 105.

Comments: The class was taught by part-time teachers and the workshop was not as well organized as Physics 105. Nevertheless class success rates were high and participants had generally positive comments about the workshops.

Physics 101: Engineering and science majors take this course as the first semester of calculus-based physics. The success of CL in the 105 class prompted the development of workshops in this class as well, although its success rates were already relatively high.

Comments: Again, students did better overall in Physics 101 after the implementation of CL, even though the instructor was the same throughout and did not change his teaching methods initially. Similar workshop methodologies to Physics 105 were used. Due to success of the CL out-of-class experiences, the instructor has additionally incorporated more collaborative group activities into his lecture and lab methods. Students are encouraged to be responsible for each others' success and do many activities in groups. The workshops are a natural extension of the classroom and labs.

The physics department at Glendale is relatively small in comparison to other departments and consists of two full-time instructors and a few part-time ones. CL workshops introduced in the Physics 105 course continue to benefit students in the higher level courses where student success rates are traditionally above 50%, in part due to smaller class sizes and highly motivated students. The department has been able to utilize a learning community approach in offering students a highly integrated curriculum.

Chemistry 101 and 102

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Chem 101 (Sp 88 to SP 94)				
Sections with no CL	1142	0	53%	2.3
Sections with optional CL				
-Regular participants	394	50-100%	56%	2.2
-Irregular participants	56	1-49%	45%	1.6
-Non participants	36	0	31%	1.6
Chem 102 (Sp 91 to Sp 94)				
Sections with no CL	138	0	73%	2.4
Sections with mandatory CL	209	100%	66%	2.2

Chemistry 101 & 102: This is the two-semester sequence of inorganic chemistry, and it seems to be another stumbling block for many students. After several initial experiments with the voluntary approach, the CL workshops are now being structured into the discussion portion of the regular lab sections of both classes. They are of the Berkeley type, with problem worksheets prepared by the instructors.

Comments: Although the workshops did not seem to improve the success rate, students and

instructors felt the workshops were successful, and this led to the restructuring of the lab schedule in the two courses. Weekly two-hour CL workshops are now a scheduled part of the lab experience and are therefore mandatory for all students in these classes. Instructor and student satisfaction is very high.

Chemistry 105 and 106

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Chem 105 (F 90 to F 93)				
Sections with no CL	83	0	63%	2.5
Sections with optional CL				
-Regular participants	30	50-100%	87%	3.3
-Irregular participants	80	1-49%	80%	2.6
-Non participants	37	0	72%	2.5
Chem 106 (Sp 91 to Sp 94)				
Sections with no CL	46	0	83%	2.8
Sections with optional CL				
-Regular participants	16	50-100%	81%	2.8
-Irregular participants	30	1-49%	70%	2.7
-Non participants	37	0	78%	2.3

Chemistry 105 and 106: These are the two semesters of organic chemistry required for pre-med and pre-dental students, as well as many science and engineering majors.

Comments: These two courses have been taught by the same instructor for the last few years, and optional workshops of the problem solving type are now a standard feature in both of them. Both instructor and participants are pleased with the results, and marked improvements have been obtained in the first of the two courses which is the most difficult hurdle for many students.

Chemistry 110: This course covers the fundamentals of chemistry and is required in many majors; it is a feeder course for Chemistry 101. CL workshops were offered during one semester. (Another workshop in Spring 92 was cancelled due to lack of participation).

Comments: Students in this class just did not see the benefits of collaborative learning and felt they achieved more studying on their own (even though test results and final grades did not bear this feeling out). In entry level classes such as this one, strong inducements to participate and well structured workshops may be necessary to attract the students and get them to think differently

about how they learn and how CL can help them: they may not have the experience or the maturity to do it otherwise.

8. Social Sciences

The social science division has offered workshops in the following courses: Economics 101, 102 and 107, History 110, Political Science 101, Psychology 101, and Social Science 123. All workshops in this division are voluntary and facilitated by student leaders with little faculty supervision at the workshops themselves. Faculty provide support and extra materials to leaders as needed. Workshops are generally an hour in length.

In the social science division, the workshops take on a different content-based quality than in a problem-solving course such as math or physics. This difference makes it less clear to students exactly how CL will benefit them. Note reviews, test preparation, and a general organization of the content are often the workshop's focus. It is always a challenge to provide activities and information that the instructors and leaders know is necessary for achievement in the class and that the students also perceive as worthwhile.

Economics 102: Principles of Macroeconomics is a course on the fundamentals of economic analysis focusing on theories of output determination, consumption, investment, inflation and other related topics. It is a pre-requisite for Economics 101 (Principles of Microeconomics). Econ 102 is often a large lecture class of over 100 students presented in an auditorium setting.

> Instructor's Comments: *CL takes time to work well, especially in the social sciences. I needed to learn how to select and train the student leaders and students needed to learn what to expect in CL workshops. I noticed increased test scores, improved work on assignments and above all, a higher level of confidence from students who attend CL. The little things count: CL groups provide a back-up for information on assignments, help in running computer programs, consolation that others also didn't receive an A on a quiz-put simply, students feel they are all in this together.*

Comments: CL workshops began in Spring 92 and have been offered continuously since then, targeting two different instructors' sections. Instructors do not usually attend the workshops, but design worksheets used by students to practice problem solving or to increase comprehension through visualization. Initially the workshops combined both instructors' sections. After some problems with pacing occurred, separate workshops were scheduled for each instructor with different student leaders facilitating the groups. This method is working better. Every semester, results are more encouraging and attendance goes up. The students in the Social Science division seem to be motivated differently than those in the Math and Science divisions. It takes a longer time span to convince them that workshops are beneficial, an enhancement and not a remediation, and therefore necessary to their success. The difference in motivation may in part be due to the fact that in the math and science areas, the applied problem solving techniques utilized are so much more obviously helpful. Students know these types of probiems will be on their next exam.

Things are not so clear-cut in the social science area. As always, language and discussion about social science topics remain "fuzzier" than math or science applications. This makes it more difficult for students to see the connection between workshop participation and success in the course. However, consistency of offerings and longevity are two factors that can lead to improved participation and increased success of objectives of CL. These comments pertain to history, political science and psychology also.

Economics

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Econ 101 (Sp 91 to Sp 94)				
Sections with no CL	369	0	62%	2.8
Sections with optional CL				
-Regular participants	16	50-100%	88%	3.1
-Irregular participants	69	1-49%	89%	2.8
-Non participants	140	0	60%	2.2
Econ 102 (Sp 88 to Sp 94)				
Sections with no CL	2227	0	73%	2.7
Sections with optional CL				
-Regular participants	94	50-100%	96%	3.0
-Irregular participants	205	1-49%	65%	2.1
-Non participants	811	0	44%	1.8
Econ 107 (F 91 to Sp 94)				
Sections with no CL	205	0	66%	2.2
Sections with optional CL				
-Regular participants	13	50-100%	85%	2.8
-Irregular participants	17	1-49%	70%	2.4
-Non participants	38	0	81%	2.7

Economics 101: This is the basic micro-economic analysis course and the course following macro-economics (Economics 102). Workshops were tried by the same 102 instructor on a rotating basis as of Spring 93.

History 110: This is a course on U. S. History and it focuses on significant events, issues, and ideas that have played a meaningful role in shaping our present-day country.

Comments: Workshops have been optional and offered several times per week for one hour in length. Participation initially was limited, but as in Economics 102, the visibility of the program each semester is increasing. Additionally, the students who did participate did significantly better, sometimes improving their grade dramatically, such as from a D to a B, during the semester.

Social Sciences

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
History 110 (Sp 88 to Sp 94)				
Sections with no CL	6293	0	49%	2.0
Sections with optional CL				
-Regular participants	57	50-100%	86%	2.5
-Irregular participants	149	1-49%	61%	2.1
-Non participants	426	0	41%	1.8
Poly Sci 101 (Sp 88 to Sp 94)				
Sections with no CL	2197	0	54%	2.0
Sections with optional CL				
-Regular participants	11	50-100%	91%	2.8
-Irregular participants	40	1-49%	75%	2.5
-Non participants	213	0	57%	2.0
Soc Sci 123 (F 91 to SP 94)				
Sections with no CL	284	0	61%	2.1
Sections with optional CL				
-Regular participants	21	50-100%	95%	2.8
-Irregular participants	24	1-49%	58%	1.9
-Non participants	93	0	40%	1.4
Psych 101 (Sp 88 to Sp 94)				
Sections with no CL	6187	0	61%	2.1
Sections with optional CL				
-Regular participants	81	50-100%	94%	3.0
-Irregular participants	140	1-49%	64%	2.3
-Non participants	172	0	40%	1.6

Political Science 101: This course is an introduction to the principles and problems of government in the U. S. focusing on politics at the national level. It has proven to be difficult for some students not as well versed in U. S. history and customs. As in Economics 102, classes are quite

large (often over 100) and held in an auditorium-like setting.

Comments: Political Science 101 began workshops during the Fall 91 semester along the Missouri format. CL workshops were again offered Spring 91 and Spring 92. All workshops were voluntary, lasted one hour, and were offered two-to-five times per week to allow more students to participate. The workshops were attached to sections all taught by the same full-time instructor. While participation and success increased during the spring and fall 92 semesters, attendance remained low overall and it was difficult to find qualified student leaders; therefore the workshop was removed from subsequent scheduling.

Social Science 123: This is a transfer course on Asian-American history. CL was added to the Fall 1993 schedule and has gotten off to a good start, even though attendance could be improved. The instructor noted that less students had dropped the course (only ten students in the three sections during the Fall 93 semester). The majority of students attending CL improved their test scores after the first exam.

Psychology 101: This is the general psychology course, focusing on scientific principles and the biological basis of behavior, perception, learning, and thinking. This course is a pre-requisite for most higher level psychology courses as well as a requirement for transfer to many four-year institutions. Sophomore standing is recommended. The workshops were voluntary and of a format similar to the one used in other social science courses.

> Instructor's Comments: *Most students who come to CL not only increase their test scores, but they meet their classmates, make new friends and come to class energized. A teacher's dream!*
>
> Students' Comments: *CL is one of the best resources GCC has to offer students. My test grades improved slowly but surely after the addition of workshops. I don't take good lecture notes, but after going to CL workshops, my grades are better now. The CL's seem to make the class more personal and I remember information better. I made good friends at the same time I am learning.*

Comments: The Psychology 101 workshops have been widely successful in terms of participation, retention and GPA. All the details fell into place to contribute to this: great CL leaders, accessible times and rooms, instructor guidance and support and a wide variety of activities designed to truly enhance student success.

9. Technical Education

The computer technology department is similar to the physics department in having a relatively small number of instructors and students and in its ability to offer a learning community atmosphere that encourages students to bond in a professional capacity with their instructors and fellow students. The following courses have been targeted for CL: ECT 101, 102, 103 and 104.

Electronics

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
ECT 101/103 (F 92)				
Sections with optional CL				
-Regular participants	9	50-100%	100%	3.1
-Irregular participants	24	1-49%	88%	2.8
-Non participants	31	0	61%	3.2
ECT 102/104 (Sp 93)				
Sections with optional CL				
-Regular participants	9	50-100%	100%	3.8
-Irregular participants	7	1-49%	100%	3.8
-Non participants	17	0	47%	1.9

ECT 101, 102, 103, 104: The Electronics and Computer Technology series is divided in two parts: the first two courses deal with the basic principles of electronics and their applications to circuits. The other two cover the principles and applications of digital technology. All these classes have a strong lab component.

CL workshops began Fall 92 and have been offered sporadically since then. All were voluntary. Student leaders needed to facilitate the sessions were often selected from the class after the first test, around the second or third week of the semester. This arrangement was made necessary by the difficulty of finding qualified student leaders who had already completed the class successfully. Workshops were held once or twice a week for an hour in length, and were held in the lab setting. While the instructors did not attend the workshops, they were usually available for questions or help since their offices were in the vicinity of the workshop room.

Comments: To date, it has been difficult to provide continuity for the ECT workshops due to the lack of available student leaders. There is little doubt, however, that CL participants benefit greatly from the workshop experience, as shown in the comparison of data between CL groups and non-participants. One instructor instead uses a collaborative format in class by selecting students who do well on the first major exam to help the rest of the class. This format has been successful in the past and will continue to be used by this instructor.

10. Visual and Performing Arts

Music 101: This course on fundamentals of music is the introduction to music theory and has been offering CL workshops for the Spring 94 and Fall 94 semesters. The nature of the course lends itself extremely well to the collaborative workshops and students who utilize the worksheets have greater success and mastery of the course. This particular section meets three hours once a week in the evening and so the workshop meets immediately before the class for an hour. As it is difficult to recruit student leaders in the evening, the instructor is currently facilitating the workshops in lieu of an office hour.

Music

Class/Sections	Number of Students	Workshops Attended	Success Rate	GPA
Music 101 (F 93 to F 94)				
Sections with no CL	62	0	77%	3.2
Sections with optional CL				
-Regular participants	10	50-100%	100%	3.9
-Irregular participants	26	1-49%	85%	3.5
-Non participants	17	0	59%	3.4

Comments: The instructor employs a variety of collaborative activities throughout the class as well as the workshops and success has been high. Student satisfaction was rated high as well.

III. GENERAL COMMENTS

Costs of the CL Program: The cost of CL is minimal when compared to the benefits to students. Based on the Fall 92-93 school year budget, providing student leaders cost the college $15.00 per year per student served, and still less if workshop attendance increases. This number does not include coordination costs but those can be kept minimal by running the program through a learning or a tutoring center. By contrast, the cost to GCC and the state for a student to repeat a course is nearly 10 times as much ($140 per unit).

Current Status of the Program at Glendale College: In the fall 94 semester, CL offered over fifty-six workshops per week in twenty-four courses taught by twenty-three instructors. CL employed some fifty student leaders, many of whom were volunteers. Several student leaders continue to be involved in the CL program even after they have transferred to four-year schools. Attendance is at a record high, with over fifty percent of students in targeted courses going to the workshops, over 30% regularly. This is a major accomplishment at a commuter campus.

Glendale's CL program is one of the largest and most successful in the area. Every semester other schools send organizers to the campus to observe the workshops and talk to the coordinator. Several of our faculty have been invited to speak to outside groups about their collaborative learning experience. The program is the basis for the partnership between Glendale College and California State University, Northridge, in a new NSF grant to improve minority participation in engineering and science programs. Most important, however, is how the students view the program: by overwhelming margins they find it quite worthwhile and in many cases, vital to their success. After five years of experimentation and development, the college must now meet the challenge of continuing this effective and cost-efficient program in the face of dwindling resources.

Overall effect: There is a great deal of fluctuation to be expected from teacher to teacher and from class to class in how successful students are in the targeted courses. What is abundantly clear, however, is that collaborative learning in general does work and does improve student success. When it is well done, and when student participation is high, the effect can be dramatic. Our five-year experiment shows these improvements quite well, in a broad variety of classes, with different instructors, and with a diversity of approaches. Whether one looks at the historical record of one particular teacher, or at the CL vs non-CL classes, or at participants vs non-participants, the workshops almost always seem to make a difference for the better.

Self-selection effect: Some questions have been raised, however, concerning the effect of self-selection in explaining the better results of CL participants as opposed to those of non-participants in optional CL classes. Clearly one would expect the more serious students to be more willing to spend the extra hour or two each week to go to the workshops. Since these are the students most likely to succeed anyway, the observed benefits of CL can at least in part be attributed to this self-selection. This is certainly true, and our results bear this out. In math classes, for instance, there is a greater difference between participants and non-participants in optional CL classes than between mandatory CL and non-CL classes. But as shown by the latter results, the effect of the

workshops proper is quite substantial. In research published on this issue[1], self-selection seemed to account for about half the observed differences between participants and non-participants, a value that is at best difficult to evaluate and may very well depend on circumstances. It may be a fair approximation in math classes, but not in Physics 105, for instance. In that class, the extrapolated success rate for full participation is about twice the rate for non-CL sections previously taught by the same instructor (about 85% vs 42%); this matches almost exactly the participant vs non-participant ratio (87% to 42%), which would indicate a negligible self-selection effect. So it may well be that the value of one half quoted above is an upper limit, perhaps more valid when participation rates are low.

Berkeley vs Missouri: Although both formats can work quite well, we seem to have had better success with the Berkeley approach of Uri Treisman. Part of the reason may be that the problem-solving workshop is less dependent on the student leaders who act more as resources than facilitators. The Missouri method, by contrast, requires the leader to attend classes and conduct the discussion, which is more demanding. Given that community colleges are commuter institutions and do not have access to juniors or seniors, let alone graduate students, it is more difficult for them to recruit the latter type of leader than the problem solving/resource type. But there are other reasons for the different successes of the two formats, and they may be peculiar to Glendale College and to the teachers involved. Still, Berkeley workshops have proven somewhat easier to organize and that has been a point in their favor.

Other benefits of the workshops: CL also helps students in various ways that go beyond their grades. In particular, it can completely change attitudes about learning and motivation. This is not always easily quantifiable, but in talking to students semester after semester and hearing about their personal triumphs, one can only be convinced that this program is doing wonderful things for students and for the institution as a whole. Another side-effect of CL is the impact it can have on student-teacher interactions. Instructors who participate find their role changed from lecturers and graders to helpers and guides. They develop a more positive rapport with their students, closer to the true aims of education and beneficial to both sides. Cooperation among CL teachers also opens new vistas of opportunities such as learning communities and other collaborative ideas.

The limits of CL: The issue of basic skills deficiencies is one that tests the limits of collaborative learning and that has implications for many disciplines. Many students come to the college with inadequate preparation in reading or writing of English or in math. They often end up in courses where these deficiencies will not allow them to succeed. In such circumstances, workshops are unlikely to help. For example if a student in Psychiatric Nursing (AH 233) does not have the reading level necessary to deal with the textbook used, no amount of CL in itself will ensure success for that student. What is needed is a reading class or additional basic skills support. Similarly, CL by itself does not seem to be able to make up for insufficient math preparation in the algebra-based Physics 105 class, as can be seen from looking at the success rates of its most mathematically weak students. What is needed there is an additional class in algebra and trigonometry or some extended one-to-one tutoring.

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[1] "Review of Research Concerning the Effectiveness of Supplemental Instruction," (National Center for Supplemental Instruction, UMKC, Kansas City, MO 64110, October 1994)

These examples bring up the limits of the CL approach. It cannot be expected to undo the effects of poor preparation or incorrect placement. Nor will it substitute for improper orientation or inadequate academic advising. By providing a place for students to work together and ask questions outside of office hours, however, it can free a teacher to play the role of academic advisor with members of the class. This can result in an enhanced community feeling and a much needed guidance opportunity for students.

The limits of collaborative learning point to the need for a multifaceted approach to increasing student success. Under-prepared students are among the fastest growing segments of our college population and the ones that are succeeding the least and dropping out the most. Yet succeeding at the community college is often the only hope these students have for a better life. This population is the hardest to serve but most important to focus on.

Increasing student participation: Getting busy commuter students to attend workshops on a regular basis is a real challenge. Unfortunately the full benefits of CL can only be realized by fairly steady participation in the groups. Often, however, students do not understand these benefits beforehand and one must find ways to entice them into the workshops at least long enough for them to see their value.

One way towards that end is to make attendance mandatory. Such workshops must be conducted during regular class or lab hours; or else they must be advertized in the class schedule, in which case students must be given the choice of registering in another, non-workshop, section of the same class. This approach has been the most effective for students. When these classes were surveyed, they indicated a high rate of satisfaction with the workshops: students did not seem to mind the extra time involved, as they realized very quickly the benefits to be derived.

In voluntary workshops, attendance is more of a challenge, but proper attention to a few key elements can make a big difference. The first is scheduling: in some classes, having workshops immediately before or after the lecture has worked quite well. In some others the sessions are scheduled during the first week after consulting the students, which also works well. Others still schedule the workshops ahead of time and advertize them in the schedule of classes: this can also work provided the times selected are relatively convenient, mornings or early afternoon for daytime classes and near class time for evening ones.

A second vital element is faculty involvement, whether actually in attending workshops or voicing in-class support. It helps enormously if the students feel that the program matters to the instructor. Meeting with student leaders on a weekly basis is definitely recommended also. In a situation where the availability of qualified competent student leaders is limited, increased faculty participation seems to be necessary to provide the vital continuity necessary for the long-lived success of the program. Faculty interest can also make everyone aware that the program is an enhancement, not a remediation, a very important distinction for most students.

A third element is connection to the course. Students do not attend workshops where they do not see a clear correlation to their next test, grade or success. One may regret this all too pragmatic attitude, but tests and grades are looked at rightly as indicators of what matters in the class, and a busy student can hardly be blamed for wanting workshops that are directly linked to them.

Offering some form of extra-credit has been done successfully, if structured carefully. For example, one instructor gives the whole class an extra 3% added to their final grade if a majority of the class regularly attends workshops. This extra-credit is in actuality very minimal but the students feel it is worth the effort. Another instructor offers students the choice of workshops or homework to earn 6% of their grade (the choice has been overwhelmingly the workshops!).

Another element is the quality and structure of the workshop. Adequate facilities, informed, well-trained student leaders, activities that provide a challenge to all students as well as a safe environment to interact in, all these contribute to the caliber of the sessions. When student leaders are totally in charge, the more highly visible they are to students, the better. Attending the lectures as much as possible enables them to better prepare for workshops and stay current on class activities. Meeting regularly with the instructor to plan strategies and talk about possible problem areas is also highly desirable, since student leaders need resources to help plan effective workshops and often do not have the time or the knowledge to develop materials themselves. Also desirable is the creation of a strategies folder, as well as a worksheet bank, for each discipline to preserve and share good ideas and methodologies.

One cannot stress too highly the need for strong, well trained student leaders with effective inter-personal skills as well as content knowledge. This is especially true in workshops where the instructor is not present. Careful selection, training and supervision are all required. A 1:10 leader:student ratio seems to work best but this is often too difficult to predict in cases where student numbers fluctuate at any given workshop. Larger numbers appear immediately before exams and tend to fall off a bit after the exam.

Many workshops are one hour long, but some need to be longer. One hour is insufficient for students to work on problem-solving activities such as math and physics. In these areas one-and-one-half to two hours is the usual duration. Proper workshop rooms are often difficult to find and will require administrative support. They should have large tables for groups of 6 or 7 to work together and the chairs should preferably have casters for easy mobility.

Finally, continuity and longevity are important for a successful workshop, especially of the optional model. Broadcasting student comments and success stories has more impact on students than dry statistics and sermons from those in charge. So does word-of-mouth publicity from former participants. Utilizing the counseling services to help promote the program is also a real help.

Program Evaluation: Continuous evaluation is necessary to improve the program each semester. A variety of methods can be implemented, including surveys before, during, and after the semester, to provide feedback from the students' (as well as the instructors') point of view as to the usefulness of the program. Tracking student success by comparing success rates, GPAs, and retention each semester, as well as by comparing them historically to other semesters, is an effective evaluative tool. Persistence (whether students reenroll and achieve their educational goals) is another measure that is significant. In classes where success is more nebulous, as in the language arts and ESL areas, other evaluation tools may be needed, such as a behavioral change indicators that focus on whether CL workshops improved specific behaviors such as study skills or writing habits.